

**Meridian Valley Creek Realignment Project
Kent, King County, Washington**

Finding of No Significant Impact

Background.

Meridian Valley Creek is a three-mile long stream that drains approximately 1,449 acres. It ultimately joins Big Soos Creek near the corner of 256th Street Southeast and 148th Avenue Southeast.

The project site is located south of 256th Street Southeast and west of 148th Avenue Southeast in the northeast quarter of Section 27, Township 22 North, and Range 5 East of the Willamette Meridian in the city of Kent, in King County, Washington.

Sometime after 1968, the lower portion of the creek was diverted from its natural course and directed into a concrete raceway. Although numerous species of fish are found within the raceway, it does not provide ideal habitat for fish. This reach of the creek has been channelized, and there is little in-stream cover or riparian vegetation, and no off-channel refuge habitat. The stream is located less than 10 feet from the roadside of 256th Street Southeast, increasing the potential for poor water quality as a result of road runoff into the stream. Fish are likely to be flushed out of the creek during high flow events. At low flow several areas of the flume present passage barriers.

Proposed Action.

The Seattle District, U.S. Army Corps of Engineers and the city of Kent propose to remove Meridian Valley Creek from the concrete flume, moving the stream away from 256th Street Southeast. The relocated stream will flow into a constructed streambed that will meander through a large wetland that borders Big Soos Creek. The relocated stream will run approximately 1,150 feet from the existing box culvert beneath 256th Street Southeast to its confluence with Big Soos Creek. At the upper end of the project, a concrete extension (approximately 30 additional feet) will be added to the existing box culvert to allow for future road widening activities, and to direct the stream away from the toe of a steep slope and into the newly constructed streambed. The new streambed will parallel 256th Street Southeast for approximately 200 feet along the toe of a steep slope. The stream channel then turns to the southeast, dropping gently to a broad wetland plain. The stream continues its southeastern course through the wetland to its confluence with Big Soos Creek. This portion of the stream will contain numerous off-channel habitat areas to provide refuge, rearing, and foraging opportunities for juvenile fish. These areas will also serve to store water during high flow events.

This project will increase available spawning habitat for adult fish, and will enhance rearing, foraging, and refuge habitat for juvenile salmonids and resident fish in the lower portion of Meridian Valley Creek by creating off-channel habitat areas, removing the stream from a source of potential water quality contamination, and through provision of a riparian buffer.

Summary of Impacts.

A Final Environmental Assessment (EA) has been prepared pursuant to the National Environmental Policy Act (NEPA) for the proposed action and is attached. The Final EA describes the environmental consequences of the project, which are briefly summarized below.

The project will result in the loss of 0.3 acres of the existing emergent and scrub-shrub wetlands on-site, and numerous trees, shrubs, and understory plants will be removed to accommodate the new channel alignment. The stream channel banks and all other disturbed areas will be restored with native emergent and herbaceous plants, shrubs, and trees. Compensatory mitigation is not required if the authorized work results in a net increase in aquatic resource functions and values in the project area. While the project will result in the loss of the 0.3 acres of existing emergent and scrub-shrub wetland, the newly constructed streambed will provide enhanced functional value of the area for fish, and similar function and value for mammals, amphibians, aquatic insects, other invertebrates, and birds.

There will be small-scale, temporary increases in turbidity within the wetland and Big Soos Creek as a result of construction activities, particularly those in the lower reach of the channel alignment through the wettest portion of the wetland. Localized shifting of sediments will continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction will continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity over that normally seen during high flow events.

In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids in Big Soos Creek, all 'in-water' construction work will take place during the appropriate fish window (August 1 to August 31, or as otherwise determined by Washington Department of Fish and Wildlife ((WDFW)) and during the driest time of the year. Construction techniques, sequencing, and timing will minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channel to the Big Soos Creek. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans will incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity. The in-water construction of this project will occur when federally listed threatened juvenile and adult Puget Sound Chinook salmon and Coastal/Puget Sound bull trout are least likely to be present in Meridian Valley and Big Soos Creeks, and during the portion of the year when bald eagles are not nesting and are most tolerant of disturbance. The Corps has received concurrence with a 'may affect, but not likely to adversely affect' determination for listed species in relation to the Meridian

Valley Creek realignment project via a concurrence letter dated March 27, 2001 from U.S. Fish and Wildlife Service and via a concurrence letter dated April 10, 2001 from National Oceanic Atmospheric Administration (NOAA) Fisheries.

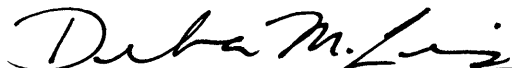
Professional cultural resources studies are being conducted for the proposed project. The studies completed to date included an examination of the archaeological and historic site records at the Washington State Office of Archaeology and Historic Preservation (OAHP), a pedestrian survey, and archaeological testing of the project area. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) or the state historic site register are located within the proposed project area. The field studies have not been completed as of this date and are continuing. If historic properties eligible for the NRHP are confirmed to be present in the project area, a programmatic agreement for data recovery (if necessary) will be developed in consultation with the Muckleshoot Tribe and the OAHP that describes specific measures to mitigate adverse effects resulting from the project.

Impacts to the human environment will also be temporary and localized. Construction vehicles may temporarily disrupt local traffic, increase air emissions and noise in the vicinity of the site, increase the volume of traffic on adjacent streets during excavation, and decrease the aesthetic attractiveness of the general area during excavation of the site. Noise, traffic, and air quality issues will be managed through implementation of appropriate control plans. Thus, these impacts will be temporary and highly localized.

Finding.

Based on the analysis detailed in the draft EA (attached) and summarized above, this project is not a major Federal action significantly affecting the quality of the human environment and, therefore, does not require preparation of an Environmental Impact Statement (EIS). A 404(b)(1) evaluation has been prepared.

23 Jun 04
Date


Debra M. Lewis
Colonel, Corps of Engineers
District Engineer

Final Environmental Assessment

Green-Duwamish General Investigation Ecosystem Restoration

Meridian Valley Creek Realignment SE 256th St. to Confluence of Soos Creek Kent, Washington



June 2004



**US Army Corps
of Engineers®**
Seattle District

**Meridian Valley Creek Realignment
SE 256th St. to Confluence of Soos Creek
Kent, Washington
June 2004**

Final Environmental Assessment

Responsible Agencies: The agencies responsible for this project are the U.S. Army Corps of Engineers, Seattle District (Corps), and the City of Kent.

Summary: The lower portion of Meridian Valley Creek currently flows through a concrete raceway/flume that parallels the south side of 256th St. SE for approximately 850 feet to its confluence with Big Soos Creek. In this reach, the creek is located less than 10 feet from the roadside, and there is minimal vegetative cover. Coho salmon (*Oncorhynchus kisutch*) utilize this stream for spawning, rearing, foraging, and as refuge habitat. However, during high flow events, the straight, vertical-sided, smooth bottom flume provides no refugia, allowing juvenile fish to be flushed into the main flow of Big Soos Creek.

The Corps and City of Kent propose to remove Meridian Valley Creek from the concrete flume, moving the stream away from 256th St. SE and into a more natural stream channel. The relocated stream will flow into a constructed streambed that will meander through a large wetland that borders Big Soos Creek. This project will increase available spawning habitat for adult fish, and will enhance rearing, foraging, and refuge habitat for juvenile salmonid and resident fish in the lower portion of Meridian Valley Creek by creating off-channel habitat areas, removing the stream from a source of potential water quality contamination, and through provision of a riparian buffer. In accordance with the National Environmental Policy Act (NEPA), this document evaluates the potential environmental impacts of the proposed restoration alternative.

The project will not constitute a major Federal action and will not significantly affect the quality of the human or natural environment. The Corps will use best management practices to minimize potential adverse effects to aquatic and terrestrial resources. Impacts to air quality, noise, and water quality will generally be highly localized and short in duration, and wetland impacts will be mitigated to a level of insignificance by providing enhanced aquatic functions and values in the project area as a result of the creek relocation.

This document is available online at: <http://www.nws.usace.army.mil/ers/envirdocs.html>

Please send requests for additional information to:

Ms. Nicolle Rutherford, Environmental Resources Section
U.S. Army Corps of Engineers, P.O. Box 3775
Seattle, Washington 98124-3755
nicolle.r.rutherford@usace.army.mil
206-764-6716

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1 INTRODUCTION

During the summer of 2004, the Corps and the City of Kent are proposing to remove Meridian Valley Creek from the concrete raceway in which it currently runs. The stream will be relocated into a constructed stream channel that is farther south of 256th St. SE than the existing raceway. The relocated stream will meander through a large wetland that borders Big Soos Creek, and flow into Big Soos Creek. This project will increase available spawning habitat for adult fish, and will enhance rearing, foraging, and refuge habitat for juvenile salmonid and resident fish in the lower portion of Meridian Valley Creek by creating off-channel habitat areas, removing the stream from a source of potential water quality contamination, and through provision of a riparian buffer.

This restoration activity is being conducted as part of the Green/Duwamish River Basin Ecosystem Restoration Program. In this program, the Corps has served as the lead in developing the restoration program for the Green/Duwamish River, working with local agencies to identify, evaluate, prioritize, and coordinate implementation of potential restoration projects to assure that the restoration programs and projects from the various agencies complement each other. As part of this ecosystem approach, two major documents have been prepared that provide general information regarding the Green/Duwamish River basin and its associated existing conditions, fish and wildlife populations, and potential impacts on federally listed endangered or threatened species. The documents are as follows:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR in November 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

Information from these reports has been incorporated into this document largely by reference.

The purpose and need statement for the Programmatic Draft NEPA/SEPA Environmental Impact Statement (DEIS) and Restoration Plan was to improve the overall health of the Green/Duwamish River basin ecosystem for fish and wildlife species by increasing the quantity, quality, diversity, and connectivity of available habitat.

The need for such improvement to the ecosystem was well established from years of study conducted by the U.S. Army Corps of Engineers (Corps), King County, the Port of Seattle, the Muckleshoot Indian Tribe Fisheries Department, the Washington State Department of Fish and Wildlife, and others.

The overall objective of the restoration project is to restore significant ecosystem function, structure, and dynamic processes that have been degraded within the river basin. To accomplish this objective, the following basin-wide restoration goals were identified:

- Improve the physical nature of existing degraded habitat.
- Improve existing ecosystem functions and values. This includes improving riverine processes where reasonable.
- Address important factors limiting habitat productivity.

The Programmatic EIS assessed the Corps proposal to implement a basinwide restoration program in the Green/Duwamish River. The purpose of preparing a programmatic EIS was to expedite and provide a point of departure for future site-specific projects, and to facilitate the preparation of subsequent project-specific NEPA and SEPA documents through the use of “tiering” or “phasing.” The origin of this restoration plan and EIS was an Ecosystem Restoration Study (ERS) conducted as a part of the Corps’ Ecosystem Restoration Program.

Restoration features at sixty-seven projects in the basin were developed and evaluated to determine the most cost effective and beneficial plan to recommend for restoration of the basin ecosystem. The recommended plan would implement a combination of 45 project-specific and programmatic restoration measures throughout the basin. This recommended National Ecosystem Restoration Plan (NER) was selected based upon cost effectiveness and incremental cost evaluation of alternative’s costs and environmental outputs. The recommended NER Plan restores aquatic and terrestrial ecosystem continuity and connectivity and addresses all limiting habitat factors for threatened and endangered salmonids within the basin.

From the suite of available projects the Green Duwamish ERP Program Manager Committee prioritized the order of implementation. The WRIA 9 Forum approved their selections. Meridian Valley Creek was identified as one of five projects that would be considered in the first year of construction. This was based on the availability of land, willingness of the local sponsor to fund the project, and advance engineering work that was done for this project.

1.1 Project Location and Setting

The project site is located south of 256th St. SE and west of 148th Ave. SE in the northeast quarter of Section 27, Township 22 North, and Range 5 East of the Willamette Meridian in the city of Kent, in King County, Washington (Appendix A: Vicinity Map). The project area covers three separate parcels: one owned by the City of Kent (Bhatia parcel), one owned by the Soos Creek Water and Sewer District, and a third that is owned by King County (Appendix A: Sheet 1). A large, scrub-shrub/forested wetland covers all of the Bhatia and King County parcels, and extends onto the Soos Creek Water and Sewer District parcel. Currently, all three parcels are undeveloped. These undeveloped parcels are bounded on the north by 256th St. SE, Big Soos Creek and the associated Gary Grant Soos Creek Park to the east and southeast, residential developments on the west and southwest, and undeveloped land to the south.

1.2 Project Background

Meridian Valley Creek is a three-mile long stream that drains approximately 1,449 acres (Aqua Terra, 1999). The lower reaches of the stream (approximately 1.5 miles) lie within the City of Kent, WA, while the upper reaches fall within unincorporated south King County, WA. Meridian Valley Creek originates from a wetland, and flows in a southeasterly direction through

North Meridian Park and the Meridian Valley Golf and Country Club. It ultimately joins Big Soos Creek near the corner of 256th St. SE and 148th Ave SE.

Sometime after 1968, the lower portion of the creek was diverted from its natural course and directed into a concrete raceway (Figure 1). The raceway is approximately 6 feet wide, with vertical sides, and a flat concrete bottom. It parallels the south side of 256th St. SE for approximately 850 feet before spilling into Big Soos Creek.



Figure 1: Meridian Valley Creek adjacent to 256th St. SE. The flume parallels the road for approximately 850 feet to the confluence of Big Soos Creek. Photo taken along the western end of the flume, facing east.

1.3 Project Need

The populations of native fish, particularly anadromous fish, are declining at a rapid rate. Two anadromous salmon species, Chinook (*O. tshawytscha*) and bull trout (*Salvelinus confluentus*) have already been listed as threatened or endangered under the Endangered Species Act (ESA), and a third species, coho, is likely to be listed in the near future. Without restorative action, many of the fish and wildlife resources of the Green/Duwamish system will continue to decline.

The Soos Creek Subbasin is an important tributary to the Green/Duwamish system. It contains diverse and abundant salmonid habitat, and the Washington Department of Fish and Wildlife (WDFW) maintains a Chinook hatchery in lower Big Soos Creek (King County, 1990). It lies in

the Middle basin of the Green/Duwamish system, and is undergoing a rapid transition from rural forested and agricultural land to an urbanized environment. This rapid urbanization has resulted in stream and wetland habitat degradation in the form of stream channelization, increased sedimentation, impaired water quality, minimal wetland and riparian buffers, and disturbed hydrological regimes. These factors, among others, have contributed to decreased fisheries production from this subbasin, and focused restoration efforts on its tributaries.

Meridian Valley Creek, a tributary to Big Soos Creek, supports a variety of fish species, including coho salmon, cutthroat trout (*O. clarki*), rainbow trout/steelhead (*O. mykiss*), bullhead (*Ictalurus sp.*), sculpin (*Cottus sp.*), and lamprey (*Lampetra sp.*). Although numerous fish are found within the raceway, it does not provide ideal habitat for fish. This portion of the creek has been channelized, and there is little in-stream cover or riparian vegetation, and no off-channel refuge habitat. The stream runs very near 256th St. SE, increasing the potential for poor water quality as a result of road runoff into the stream. In the lower half of the raceway, near its confluence with Big Soos Creek, the gradient of the raceway is about one percent and contains high-quality gravel suitable for coho spawning. However, in the upper half of the raceway, the stream gradient increases to about four percent, and the flat concrete bottom is exposed (Harza, 1999). During high flows, it is likely that juvenile fish are flushed out of this portion of Meridian Valley Creek and into the much larger Big Soos Creek. In addition, the change in gradient causes a large amount of deposition to occur in the lower portion of the flume (hence the high-quality spawning gravel in this area). During low flow conditions (less than 10 cfs), this gravel can act as an impediment to fish passage into the flume from Big Soos Creek. During low flow conditions, the upper half of the raceway is also probably an obstacle to fish passage due to the gradient and the presence of perpendicular iron angle bars in the streambed. These features of the upper flume may prevent upstream migration and subsequent utilization of excellent upstream habitat (Harza, 1999).

1.4 Project Purpose

The project purpose is to restore natural function to this portion of Meridian Valley. The project should improve in, and near-stream habitat quality and complexity, improve fish passage conditions for adult resident and anadromous fish, improve rearing habitat for juvenile fish, provide spawning habitat, and maintain or improve water quality for use by all life stages of salmonid fish or other aquatic or terrestrial wildlife.

1.5 Authority

Federal involvement in ecosystem restoration is supported in law and Executive Order. The Corps Civil Works Ecosystem Restoration Policy (ER 1165-2-501), the Fish and Wildlife Coordination Act of 1958, Federal Water Project Recreation Act of 1965, National Environmental Policy Act of 1969, Water Resource Development Act (WRDA) of 1986, and the WRDA of 1990 provide national policy directing consideration of projects that benefit ecological resources.

Specifically, Section 306 of the WRDA of 1990 authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps. The Green/Duwamish Ecosystem Restoration Study stems from the Corps' authority under Section 216 of the River and Harbors and Flood Control Act of 1970, which enables the Corps to undertake restoration

related to the hydrologic regime of aquatic ecosystems. Congress specifically authorized the Green/Duwamish River Basin Feasibility Project (of which this project is a part) in Section 101(b)(26) of WRDA 2000.

1.6 Project Description

The project consists of removing Meridian Valley Creek from the 850-foot concrete raceway/flume in which it currently runs, and relocating it to a constructed stream channel that is farther south of 256th St. SE than the existing flume. The relocated stream will meander through a large wetland that borders Big Soos Creek, and flow into Big Soos Creek. The relocated stream will run approximately 1,150 feet from the existing box culvert beneath 256th St. SE to its confluence with Big Soos Creek. At the upper end of the project, a concrete extension (approximately 30 additional feet) will be added to the existing box culvert to allow for future road widening activities, and to direct the stream away from the toe of a steep slope and into the newly constructed streambed (Appendix A: Sheets 6, 7). The new streambed will parallel 256th St. SE for approximately 200 feet along the toe of a steep slope (Appendix A: Sheet 9). The stream channel then turns to the southeast, dropping gently to a broad wetland plain. The stream continues its southeastern course through the wetland to its confluence with Big Soos Creek (Figure 2; Appendix A: Sheets 2, 8). This portion of the stream contains numerous off-channel habitat areas to provide refuge, rearing, and foraging opportunities for juvenile fish. These areas will also serve to store water during high flow events (Appendix A: Sheet 8). The constructed streambed is designed to reach creek bankfull conditions at the 1.5 year event. The off-channel habitat areas are designed to be full of water at the 2-year storm event (approximately 130 cfs).



Figure 2: Aerial photo of site with proposed channel configuration.

The upper portion of the constructed stream channel will be lined with a low-permeable material to minimize flow losses from the creek to the underlying aquifer. The channel will be approximately seven feet wide across the bottom and eleven feet wide across the top. Side slopes in this section of the stream will be 1H:1V or gentler on the roadside (north) of the constructed channel, and 1H:6V on the hillside (south) of the channel due to the steepness of the cut slope (Appendix A: Sheet 10). On the hillside of the channel, a rock wall comprised of 30" minus rock will stabilize the bank to minimize the cut into the slope. The rock wall will extend along the toe of the steep slope for approximately 200 feet (Appendix A: Sheet 11). In the transition area between the higher-grade portion of the channel and the lower grade portion of the channel (between station 7+00 and 8+00), side slopes will be 1H:1V. Boulder/cobble backfill underlain by geotextile material will be utilized to stabilize the bank. Native soil overlain by eight inches of topsoil will be backfilled on top of the boulder/cobble mix to match the slope and to provide soil for planting native plants (Appendix A: Sheets 10, 16, 17).

In the lower reach of the stream channel through the wetland, the channel will be ten feet wide at the bottom and have a top width of eighteen feet. This area is relatively flat, and will require minimal grading into the wetland to establish the streambank. Side slopes in this area will be 2:1 (Appendix A: Sheet 10). Upon completion of construction, all exposed soil will be hydroseeded and planted with native species. (Appendix A: Sheets 15, 17). Some emergent species from the disturbed wetland may be salvaged and replanted.

Average channel depth will range from one and one half feet to three feet. To control and prevent bed and bank erosion, and to encourage stream equilibrium, log weirs or rock drop-pool gradient control structures, large woody debris (LWD), log vanes and deflectors, and bio-engineering will be used in the design (Appendix A: Sheet 12).

The final element of the proposed channel relocation is the establishment of an interpretive trail. The trail will start from the right of way on 256th, and run through the upland buffer, ending in a viewing platform at the edge of the stream and near a backwater lobe (Appendix A: Sheet 13 – Trail Option “B”). An additional spur from the trail (Option “A”) was designed, but there are no plans to develop it at this time.

Construction is planned for the summer and early fall of 2004 when soils will be the driest. Site access will most likely occur via a temporary access road that is constructed over the centerline of the planned stream alignment. The road may be laid on a geo-textile grid and/or a timber lattice or mat that is able to support the necessary construction equipment and material loads. Quarry spalls or a similar material will be used to construct the road. As the stream channel is excavated, the road materials will be removed, back cast, and stockpiled for off-site disposal. In the wetter portions of the wetland, load dispersing mats and “spider” type construction equipment will most likely be used in an effort to minimize vegetative and soil disturbance, reduce water quality impacts, and to reduce the use of imported materials.

Spoils from the stream channel excavation will be disposed of off-site. Alternatively, some spoils may be side-cast into the wetland to create hummocks that will be planted with native vegetation. Approximately 13,357 square feet (0.3 acres) of wetland will be impacted from the

excavation of the stream channel and associated backwater lobes. Additional wetland impacts will occur if some portion of the spoils are side-cast into the wetland to create hummocks. The intent of creating the hummocks would not be to create upland areas within the wetland. The hummocks would remain wetland areas, but the slightly higher elevation would allow the establishment of shade tolerant, wetland adapted conifers like western red cedar (*Thuja plicata*), ultimately providing a source of large woody debris to Big Soos Creek.

1.7 Associated Studies and Reports

As stated earlier, general information regarding the Green/Duwamish River basin and its associated existing conditions, fish and wildlife populations, and potential impacts on federally listed endangered or threatened species can be found in the following documents:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR in November 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

In addition, general information regarding the Soos Creek Subbasin can be found in the following documents:

Soos Creek Basin Plan and Final Environmental Impact Statement prepared by the King County Surface Water Management Division in June 1990.

“Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island).” Kerwin, J. and T. S. Nelson, (Eds.). Produced by the Washington Conservation Commission and the King County Department of Natural Resources in December 2000.

Because information specific to Meridian Valley Creek is limited, information related to the Soos Creek subbasin, and in particular, Big Soos Creek, is used in some sections as a reference for general baseline conditions.

2 ALTERNATIVES ANALYSIS

Following is a summary of alternatives presented and evaluated in the 2000 FEIS:

Alternative 1: No Action

The No Action Alternative consists of the continuation of a variety of restoration activities under existing regulations and tribal, agency, and non-governmental organization restoration programs. Current independent management of the river basin by various agencies would continue, implementing activities under existing policies. Restorations would be implemented would also be tied to the individual programs.

Alternative 2: Multi-Species Approach (Preferred Alternative)

The Preferred Alternative would be a program to restore ecological resources and processes that would benefit multiple fish, riparian, and riverine-associated wildlife species. This alternative would focus on implementing a balance of activities that would not be at the expense of maintaining or improving successful populations of other species. This approach assumes restoration of larger areas of aquatic environment and riparian corridors, and providing connections to existing productive habitat that might otherwise not occur under the No Action Alternative.

Alternative 3: Single Species Restoration (Chinook Salmon)

This alternative focuses on restoring fish habitat to benefit a single species, the threatened Chinook salmon as identified by the National Marine Fisheries Service under the Endangered Species Act, rather than a multi-species approach.

Further information on the three alternatives considered can be found in Chapter 2 of the EIS. Site specific alternatives were evaluated for Meridian Valley Creek and analyzed to see how they meet the objectives of the preferred alternative identified in the EIS and feasibility:

2.1 The No-Action Alternative

Under the no-action alternative, Meridian Valley Creek will remain in the flume adjacent to 256th St. SE. The channel will continue to have little in the way of a riparian buffer, and the potential for water quality problems as a result of stormwater runoff from the road will remain high. The upper portion of the flume will continue to be a barrier to fish passage during low flow periods, and during high-flow periods, fish will continue to be flushed into Big Soos Creek because of the relatively high gradient of the upper flume and the lack of off-channel refuge habitat in the flume. These habitat problems will continue to contribute to the decline of the fisheries in the Soos Creek Subbasin, and ultimately, to the Green/Duwamish Ecosystem and would be counter to the goals identified in the EIS.

2.2 Fix the flume in place

In this scenario, Meridian Valley Creek would remain next to 256th St. SE, but the concrete flume would be replaced with a more natural streambed. While feasible, this alternative does not meet several of the restoration objectives, including moving the stream away from the road, a potential source of pollutants to the stream. In its current location, it is not possible to provide a riparian buffer between the road and the stream that could act as a biofiltration strip for the removal of those contaminants, and that could also provide shade, organic material, and LWD to the stream. The gradient of the upper portion of the channel would remain the same, impeding upstream fish passage. Finally, although there are no expansion plans at this time, it is likely that this portion of 256th St. SE will be widened at some point to accommodate increased traffic along this arterial and to match the widened road west of 132nd Ave. SE. Consideration of these factors resulted in the elimination of this alternative.

2.3 Alternative configurations of the proposed constructed stream channel on-site

Alternative on-site configurations of the stream channel were explored, but the location of the upper portion of the new streambed is constrained by the topography of the site, and by the presence of a new lift station to be constructed by the Soos Creek Water and Sewer District (SCWS) in the summer of 2004. SCWS worked closely with the City of Kent in determining the location of the new lift station. Their negotiations resulted in the current lift station location and stream configuration. Alternative locations for the lift station were discussed, including placing the lift station on the north side of 256th St. SE, or placing the lift station closer to 256th St. SE and having the relocated stream channel run to the south of the lift station. Locating the lift station on the north side of 256th St. SE did not meet the needs of SCWS. Locating the lift station closer to 256th St. SE was feasible, but moving the stream farther to the south is complicated by the topography of the site. In the proposed (preferred) configuration, the relocated stream channel runs along the toe of the existing slope. Moving the upper portion of the channel farther to the south will result in needing to cut through the hill, impacting a much larger area to create stable side slopes.

The lower portion of the flume is sited to have as little impact to the scrub-shrub/forested portion of the wetland as possible. Moving the channel farther to the south requires removing a larger amount of trees and shrubs and impacting a larger wetland area, while placing the channel farther to the north restricts the number of off-channel habitat areas that can be constructed and reduces the buffer between the road and the channel. This alternative would improve in, and near-stream habitat quality and complexity, improve fish passage conditions for adult resident and anadromous fish, improve rearing habitat for juvenile fish, provide spawning habitat, and maintain or improve water quality for use by all life stages of salmonid fish or other aquatic or terrestrial wildlife, thereby meeting the goals of developed in the EIS.

3 EXISTING ENVIRONMENT

Characteristics of the existing environment have been addressed in detail within a number of documents previously prepared as part of the Green/Duwamish River Basin Restoration Program. Characteristics of the existing environment that are specific to Meridian Valley Creek and the proposed project site are described in detail below based on reconnaissance work and review of available documentation. Rather than repeating information for the general Green/Duwamish River system here, that information is incorporated largely by reference to the documents listed below:

Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR in November 2000.

Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

3.1 Physical Characteristics

The history and physical characteristics of the Green/Duwamish River basin are described in detail in Sections 3.1 and 3.2 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (1990) in the section titled “Earth.” A description of the physical characteristics and historic conditions relevant to the proposed restoration project site is presented below.

The project is located in the City of Kent in King County, WA. This area of King County is changing rapidly from forested/rural to one that is heavily urbanized. The lower reaches of the stream (approximately 1.5 miles) lie within the City of Kent, WA, while the upper reaches fall within unincorporated south King County, WA. This watershed is heavily developed, but there are still riparian areas that are well-vegetated. These occur mostly in the upper watershed. In reviewing aerial photos, it appears that the area surrounding the lower reach of the creek has been agricultural in nature since at least the early 1930’s (Figure 3).



Figure 3: 1936 aerial photo with major features labeled.

Meridian Valley Creek is three miles long and drains approximately 1,449 acres (Aqua Terra, 1999). It originates from a wetland through which there is no clearly defined stream channel.

Silt is the dominant substrate, and there is very little actual flow. This portion of the stream contains very little habitat suitable for salmonids. Downstream of the wetland, the stream flows southeast through a well-vegetated riparian corridor (approximately 1.4 miles). King County has completed some restoration work in this portion of the stream, including riparian planting, channel restoration, and replacement of a culvert beneath 240th St. The stream is well-shaded through this reach, and there are numerous pools and riffles that provide good rearing habitat (HARZA, 1999).

The stream continues its southeasterly course through the Meridian Valley Golf and Country Club (approximately 1.0 mile). In this reach, the stream is either channelized or directed into large water hazards (engineered ponds). There is little to no riparian vegetation (Figure 4).



Figure 4: Meridian Valley Creek on the grounds of the Meridian Valley Golf and Country Club.

Southeast of the country club, the stream flows through a well-vegetated riparian corridor (approximately 800 feet) that contains numerous gravel-dominated pools. HARZA (1999) rates this stream reach as “excellent” salmonid spawning and rearing habitat.

From this reach, the stream passes beneath 256th St. SE through a large box culvert. This box culvert was replaced in the mid-1990’s, and there have been no reports of it being a fish passage

barrier. From the box culvert, the stream is directed into a concrete raceway/flume that is approximately 6 feet wide, with vertical sides, and a flat concrete bottom (Figure 1). From review of aerial photos, it appears that the creek was diverted from its natural course and into the flume sometime after 1968. The flume parallels the south side of 256th St. SE for approximately 850 feet to its confluence with Big Soos Creek (Figure 5).



Figure 5: The confluence of Meridian Valley Creek and Big Soos Creek.

In the upper half of the flume, the stream gradient is about four percent, and the flat concrete bottom is exposed (Harza, 1999). There are numerous iron angle bars set into the bottom of the flume perpendicular to the channel that may have been installed to act as velocity breaks to facilitate fish passage. However, during low flow periods (less than 10 cfs), these angle bars are likely to present a fish passage barrier to both juvenile and adult fish. In the lower half of the raceway, near its confluence with Big Soos Creek, the gradient of the raceway is about one percent. The gradient change results in a large amount of gravel deposition, creating spawning habitat for coho salmon. During low flow conditions, this gravel can act as an impediment to fish passage from Big Soos Creek into the flume (or vice versa).

3.2 Topography, Geology, and Soils

In the western portion of the project area, the proposed creek alignment runs along the toe of a steep slope that rises to the west and to the south. The SCWS lift station will be at the top of the

slope, south of the proposed creek alignment. The proposed creek alignment follows the toe of the slope east for approximately 200 feet, passing through a small wetland (2,163 square feet) that lies adjacent to the existing flume. The creek alignment then turns to the southeast, passing through a large, relatively flat wetland that continues off-site. The wetland slopes very gently to the south and to the east down to Big Soos Creek.

According to the King County Soil Survey (Snyder et al., 1973), there are six different soil types in the project area. From west to east, the on-site soils include Alderwood Gravelly Sandy Loam, six to fifteen percent slopes (AgC); Alderwood Gravelly Sandy Loam, 15 to 30 percent slopes (AgD); Everett Gravelly Sandy Loam, 15 to 30 percent slopes (EvD); Bellingham Silt Loam (Bh); and Seattle Muck (SK) that is adjacent to Big Soos Creek. South of the Bellingham deposit, there is a small area of Norma Loam (No) soil.

The Alderwood soils are moderately well drained soils found on upland areas. The soils formed under conifers in glacial deposits. The permeability of these soils is moderately rapid in the surface layer and subsoil, and very slow in the substratum. Alderwood gravelly sandy loam, six to fifteen percent slopes, has slow to medium runoff, and moderate erosion potential. Alderwood gravelly sandy loam, 15 to 30 percent slopes, has medium runoff, but the erosion hazard is severe. These soils also have a moderate potential for slippage. Numerous inclusions are found in these soils, but inclusions make up no more than 30 percent of the mapped unit. Alderwood soils are not typically hydric soils.

Everett Gravelly Sandy Loam, 15 to 30 percent slopes occurs in long, narrow swathes along drainageways or on short slopes between terrace benches. These soils formed in gravelly glacial outwash deposits on terraces and terrace fronts. These soils are typically excessively drained with medium to rapid runoff, and a moderate to severe hazard of erosion. Everett Gravelly Sandy Loam is not a hydric soil. Inclusions make up less than 30 percent of the mapped unit.

Bellingham Silt Loam is a poorly drained, hydric soil that formed in alluvium. It is typically found in depressions on the upland glacial till plain. Permeability and runoff are slow, and erosion hazard is slight. Inclusions make up less than 15 percent of the mapped soil unit.

Seattle Muck is a poorly drained organic soil that is found in depressions and valleys on the glacial till plain and in river and stream valleys. Permeability of this soil is moderate. The slope of this soil is typically less than one percent, and runoff tends to pond. There is little to no erosion hazard. Seattle Muck is a hydric soil. Inclusions make up less than 30 percent of the mapped soil unit, and are typically hydric.

Norma Loam is a poorly drained, hydric soil that formed in alluvium. These soils are in basins on the glaciated uplands, and in areas along stream bottoms. Permeability of this soil is moderately rapid. The slope of this soil is typically less than two percent, runoff is slow, and the hazard of erosion is slight. Stream overflow is a severe hazard in some places. Inclusions make up no more than 5 percent of this soil unit.

A hydrogeologic characterization study along the creek centerline defined six hydrogeologic zones (Northwest Land and Water, Inc., 2003). The following information is taken directly from

the study. Four thin zones were defined in the upper reach of the proposed stream channel and include:

Miscellaneous fill (consisting of gravel and other materials), sand, and silt interbeds, which cap the area along its highest extent.

A sandy silt layer (with silty sand), which caps the reach between 550 to 900 feet from its confluence with Big Soos Creek.

Coarser textured material including silty sands with gravels.

Interbedded sands and silts which comprise the lowermost zone.

In the lower reach of the proposed stream channel, two additional zones were defined as follows:

Highly compressible, wet silty clay to clayey silt with abundant organic matter. This material caps the entire lower reach.

Clayey or sandy silts with zones of loose sand or lenses of gravel with sand (floodplain deposits). This material contains abundant wood fragments.

3.3 Hazardous and Toxic Material

A Preliminary Assessment Screening (PAS) was performed by the Environmental Engineering and Technology (ET) Section of the Seattle District Corps of Engineers to determine whether any hazardous or toxic material is present on or around the site that could affect project activities. State and local government environmental databases were reviewed and the proximity of the nearest hazardous waste generators, facilities, underground storage tanks, and leaking underground storage tanks was documented. Historical aerial photos and real estate records were reviewed to identify activities or property uses that may have contributed hazardous material to the project site. Previous reports were reviewed to identify any environmental concerns, and a site visit was performed by an environmental engineer from the ET section and a local resident in order to observe signs or indications that hazardous waste may be present. The PAS report (USACE, 2004) documents the findings and is available on request.

The PAS found that the site had been used for agricultural and/or residential purposes for the time period from approximately 1900 to 1980 and had been unoccupied since the early 1980s. The PAS found that there was no record or evidence of hazardous or toxic material in or around the project site that is expected to affect project activities. The PAS also found that there are no indications that the lift station presently being constructed by Soos Creek Sewer and Water immediately north of the project site will have adverse environmental impacts on the project site.

3.4 Hydrologic Regime

The historic and current hydrological characteristics of the Green/Duwamish River basin are described in detail in Section 3.3 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (1990) in the section titled "Water,"

and the WRIA 9 Habitat Limiting Factors and Reconnaissance Report – Part II in the section titled “Hydrology” (Kerwin and Nelson, 2000). A discussion of hydrological conditions relevant to the proposed restoration project site is presented below.

The headwaters of Meridian Valley Creek originate from a wetland. Clark Lake Outlet, unnamed small tributaries, small wetlands, rainfall, and groundwater inflows provide additional hydrology to the stream. The area the stream drains is flat to rolling terrain that is heavily developed. The tributary has a high flow rate relative to the area that it drains (King County, 1990).

Mean monthly stream flow fluctuates on a seasonal basis, with December through February having the highest flows, and July through September the lowest flows. Stream flows in December and January generally average 9.5 cfs, and 9.9 cfs in February. In March, flows begin to decline, averaging 8.6 cfs in March, 6.2 cfs in April, 3.9 cfs in May, and 2.8 cfs in June. July, August, and September have the lowest average flows at 1.7 cfs, 1.4 cfs, and 1.9 cfs respectively. In October, flows generally begin a steady increase, averaging 3.7 cfs for October and 7.6 cfs for November (MGS Consulting, 2003).

MGS Engineering Consultants, Inc (2003) used the Hydrologic Simulation Program-Fortran (HSPF) model to calculate peak annual discharge magnitude-frequency estimates for Meridian Valley Creek at its confluence with Big Soos Creek. During a two-year storm event, the creek conveys approximately 103 cubic feet per second (cfs), while at a ten-year event, the stream conveys approximately 189 cfs. A 100-year event results in approximately 335 cfs. Based on forecasts of future land use in this drainage area, the flows increase to 132 cfs, 230 cfs, and 391 cfs for the two-year, 10-year, and 100-year events respectively.

During flood events, water overtops the bridge crossing of Big Soos Creek at 256th Ave. SE, and the eastern portion of the large on-site wetland absorbs floodwaters greater than 300 feet away from Big Soos Creek. The bridge is predicted to flood every 10 years under future land use conditions (King County, 1990). Overland flows from Meridian Valley Creek do not appear to discharge to the small wetland in the northwest portion of the project area.

Two wetlands lie within the project area (Associated Earth Sciences, Inc, 2003; Shannon and Wilson, 2003). The smaller wetland (2,163 square feet) is located in the northwestern portion of the project site, adjacent to the concrete flume that conveys Meridian Valley Creek. This wetland occurs in a small depression at the toe of a steep slope, but is elevated above the level of the flume. It does not appear to receive overland flows from the creek. However, it is likely that groundwater exchange with the creek via cracks in the concrete flume influences the supporting hydrology for the wetland. Groundwater discharge from the adjacent hillside also likely supplies hydrology to the wetland. Under the City of Kent rating system, this wetland qualifies as a Category 2 wetland due to the presence of a forested class and its small size (less than one acre) (City of Kent Municipal Code). Under the Washington State Department of Ecology (WA DOE) wetland rating system, this wetland qualifies as a Category III wetland (WA DOE, 1997).

The larger wetland is located in the east and southeast portions of the project area, and continues off-site to the south. This wetland is greater than ten acres in size, is contiguous with Big Soos Creek, and lies within the 100-year floodplain of Big Soos Creek. In the northwestern portion of

this wetland, the wetland is depressional, changing to a gentle slope to the south and to Big Soos Creek. Under the City of Kent rating system, this wetland is a Category 1 wetland due to its size and the presence of multiple wetland classes, one of which is open water provided by Big Soos Creek, and the documented presence of Chinook salmon, a species listed as threatened under the ESA (City of Kent Municipal Code). Under the Washington State Department of Ecology (WA DOE) wetland rating system, this wetland also qualifies as a Category I wetland due to the documented presence of listed species (WA DOE, 1997).

3.5 Water Quality

The historic and current water quality characteristics of the Green/Duwamish River basin are described in detail in Section 3.4 of the FPEIS (USACE and King County DNR 2000).

Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Water,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – Part II in the section titled “Water Quality” (Kerwin and Nelson, 2000). A discussion of water quality conditions relevant to the proposed restoration project site is presented below.

In general, Soos Creek has some of the region’s best water quality of the smaller creeks in the urban portion of King County. It is described by Washington Department of Ecology (WA DOE) as being a Class A waterbody that has excellent water quality (Kerwin and Nelson, 2000). However, ten reaches within the subbasin are on the state’s 303(d) list of impaired water bodies for exceeding the state criteria for fecal coliforms, dissolved oxygen, and temperature. This includes two reaches in Big Soos Creek - one in the reach just above the confluence of Big Soos Creek with Meridian Valley Creek that exceeds fecal coliforms, and a reach farther upstream near river mile (RM) 10.5 that exceeds Class A standards for dissolved oxygen and fecal coliforms (Kerwin and Nelson, 2000).

Water quality information for Meridian Valley Creek is limited. In 1999 – 2000, Taylor Associates (2000) conducted a small water quality study for the City of Kent, collecting baseline information, and sampling again during two storm events. Under baseline conditions, temperature exceeded the Class A standard of 18° at a station just upstream of the project site at 144th Ave. SE, near the Meridian Valley Golf and Country Club (22.8°). Farther upstream at 132nd Ave. SE and 235th St. SE, fecal coliforms also exceeded the state standard of 100 organisms per 100 ml (820/100 ml). Dissolved oxygen, turbidity, and pH were all within the acceptable standards. Most of the metals sampled were below the minimum detectable level with the exception of zinc at 0.007 mg/l in the flume, and 0.013 mg/l at the site upstream of the golf course. A separate survey by Northwest Land and Water, Inc. (2003) noted a localized area with a high concentration of suspended iron complexes in the Category I wetland.

In general, samples collected during the storm events showed elevated levels of fecal coliforms at both sampling stations, fluctuations in dissolved oxygen levels, and an increased occurrence of metals, in particular, total and dissolved zinc and copper. However, copper is the only metal that exceeded the water quality standards established in the WAC (Taylor, 2000). The increased levels of metals are probably due to stormwater runoff from the surrounding impervious surfaces.

Aquatic insects were also collected in the study to evaluate the health of the creek system by using the Benthic Index of Biotic Integrity, or B-IBI, as a “report card.” A score of 46-50 is generally considered excellent, 38-44 good, 28-36 fair, 18-26 poor, and 10-16 very poor (Fore et al., 1997). In the Taylor Associates study, Meridian Valley Creek scored a 22 at the station near the project site, and an 18 at the upstream site. A separate B-IBI measure by SalmonWeb (2000) scored the creek at 14. These scores are in the poor to very poor range.

3.6 Vegetation

The historic and current characteristic vegetation of the Green/Duwamish River basin are described in detail in Section 3.6 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – Part II (Kerwin and Nelson, 2000) in the section titled “Riparian Condition.” A discussion of vegetative conditions relevant to the proposed restoration project site follows.

In general, there is very little mature native vegetation in the riparian zone along Big Soos Creek; most of the riparian vegetation consists of patches of native deciduous trees that are generally small. The remainder of the riparian zone is composed primarily of shrubs or grass. Bank stability, shade, and organic matter recruitment are considered poor along approximately 65 percent to 80 percent of Soos Creek. Impairment of riparian functions along mainstem Soos Creek occurs primarily because of industrial (including powerline corridors) or residential development adjacent to the stream.

3.6.1 Upland Areas

The western upland portion of the project site contains a moderate slope dominated by a mixed canopy of big-leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and black cottonwood (*Populus balsamifera*). Understory plants include red elderberry (*Sambucus racemosa*), salmonberry (*Rubus spectabilis*), vine maple (*Acer circinatum*), dewberry (*Rubus ursinus*), Himalayan blackberry (*Rubus discolor*), and swordfern (*Polystichum munitum*). As one progresses east across the site, the vegetation changes to immature red alder and dense patches of Himalayan blackberry intermixed with evergreen blackberry (*Rubus laciniatus*). Continuing east, the vegetation changes to Scot’s Broom (*Cytisus scoparius*), redtop (*Agrostis alba*), reed canarygrass (*Phalaris arundinacea*), and creeping buttercup (*Ranunculus repens*) with scattered buckthorn cascara (*Rhamnus purshiana*) and Douglas hawthorne (*Crataegus douglasii*).

Large black cottonwood trees line the southern edge of the existing flume.

3.6.2 Wetland Areas

Black cottonwood and salmonberry dominate the small wetland in the western portion of the property.

The large wetland contains both emergent and scrub/shrub wetland habitats. In the emergent portion of the wetland, small-fruited bulrush (*Scirpus microcarpus*) dominates. In the drier portions of the wetland, near the wetland edge (west), redtop, velvet grass (*Holcus lanatus*), and

soft rush (*Juncus effusus*) are the dominant plants with some timothy (*Phleum pratense*), reed canarygrass and curly dock (*Rumex crispus*) intermixed. In the scrub/shrub portion of the wetland, Pacific willow (*Salix lucida*) dominates the canopy. Red-osier dogwood (*Cornus sericea*), scattered black cottonwood and red alder also occur. The small-fruited bulrush becomes less common and is replaced by an increasing amount of reed canarygrass and various sedges (*Carex sp.*).

3.7 Fish

The historic and current characteristic fish communities of the Green/Duwamish River basin are described in detail in Section 3.5 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the sections titled “Current and Historic Salmonid Populations” and “Fish Passage.” A discussion of fish species relevant to the proposed restoration project site follows.

Six species of anadromous fish are found in the Soos Creek System, including fall Chinook, coho, chum (*O. keta*), sea-run rainbow trout or steelhead, sea-run cutthroat, and Dolly Varden char (*Salvelinus malma*) (King County, 1990). In addition, the system contains resident cutthroat and rainbow trout, and remnant populations of spring and summer Chinook may occur in the mainstem. WDFW manages a hatchery on lower Soos Creek at RM 0.7 that produces Chinook and coho, and coho hatchery fry are planted in Big Soos Creek.

Meridian Valley Creek supports a variety of fish species, including coho salmon, cutthroat trout, rainbow trout/steelhead, bullhead, sculpin, and lamprey (HARZA, 1999). Naturally produced coho fry have been sampled, and non-hatchery adults have been observed spawning in the creek (HARZA, 1999).

Salmonid spawning occurs in the Soos Creek system from August through March. Smaller tributaries like Meridian Valley Creek are utilized heavily by juvenile salmonids, particularly coho, steelhead, and sea-run cutthroat trout, as rearing habitat. The principal juvenile salmonid out-migration season occurs from mid-April through mid-July for coho, steelhead, sea-run cutthroat, and chinook (Grette and Salo 1986, USACE 1997).

As federally threatened species, the occurrence and potential effects of the proposed project on Puget Sound chinook salmon and Coastal/Puget Sound bull trout are addressed in Section 4.6.

3.8 Wildlife

The historic and current characteristic wildlife communities of the Green/Duwamish River basin are described in detail in Section 3.7 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the section titled “Non-native Species.” A discussion of wildlife relevant to the proposed restoration project site follows.

The large on-site wetland and the riparian corridor associated with Big Soos Creek provide excellent habitat for a variety of wildlife species. Common urban wildlife such as coyotes (*Canis latrans*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), beaver (*Castor canadensis*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), rats (*Rattus sp.*), mice (*Mus sp.*), and voles (*Microtus sp.*) are likely to be found in the area. Numerous bird species including great blue herons (*Ardea herodias*), white-crowned sparrows (*Zonotrichia leucophrys*), song sparrows (*Melospiza melodia*), common yellowthroat (*Geothlypis trichas*), yellow warbler (*Dendroica petechia*), northern flickers (*Colaptes auratus*), American robins (*Turdus migratorius*), American crows (*Corvus brachyrhynchos*), spotted towhees (*Pipilo maculatus*), red-winged blackbirds (*Agelaius phoeniceus*), dark-eyed juncos (*Junco hyemalis*), black-capped chickadees (*Poecile atricapillus*), and marsh wrens (*Cistothorus palustris*) are likely to use the project area. In addition, a great blue heron (*Ardea herodias*) nest was observed in a tree adjacent to Big Soos Creek (right bank) on the northern side of 256th St. SE, just above the confluence of Meridian Valley Creek and Big Soos Creek. The nest fledged 2 young in 2000 (WDFW, 2003). Bald eagles (*Haliaeetus leucocephalus*) are frequent the Big Soos Creek corridor, and there is a known bald eagle nest located approximately 1.25 miles away from the project site that fledged two young in 2001 (WDFW, 2003). Other resident and migratory bird species are expected to inhabit and utilize available habitats on-site during some portion or all of the year. Tree frogs and garter snakes (*Thamnophis sp.*) may also utilize the site.

King County (1990) noted that some unusual species occur within the Soos Creek subbasin including the Pacific giant salamander (*Dicamptodon ensatus*), water ouzels or dippers (*Cinclus mexicanus*), kingfishers (*Cerule alcyon*), Cooper's hawk (*Accipiter cooperii*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*), and river otters (*Lutra canadensis*). The riparian corridor along the majority of the length of Big Soos Creek provides excellent, contiguous, diverse habitat that enables wildlife dispersion and movement.

As a federally threatened species, the occurrence and potential effects of the proposed restoration project on bald eagles is addressed in Section 4.9.

3.9 Threatened and Endangered Species

The potential occurrence of federally listed threatened and endangered species within the Green/Duwamish River basin are described in detail in Section 3.7.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of this information relevant to the proposed restoration project site is presented below.

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. The Corps prepared two Programmatic Biological Assessments (BA) to assess potential impacts of the proposed work on species protected under the Act, one for species under the jurisdiction of the USFWS and one for species under the jurisdiction of NOAA Fisheries. Those BAs covered the federally listed threatened or endangered species listed in Table 1. Only the bald eagle, chinook salmon, and bull trout occur within the vicinity of the Meridian Valley Creek restoration site. Bald eagles frequent the Big Soos Creek corridor, and there is a known bald eagle nest located approximately

1.25 miles away from the project site. Chinook and bull trout distribution is assumed throughout Big Soos Creek.

Table 1. Protected Species Addressed in Programmatic Biological Assessment Documents

Species	Listing Status	Critical Habitat
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated
Gray Wolf <i>Canis lupus</i>	Threatened	
Canada Lynx <i>Lynx canadensis</i>	Threatened	—
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	—
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated

3.10 Cultural Resources

The cultural and historic resources of the Green/Duwamish River basin are described in detail in Section 3.16 of the FPEIS (USACE and King County DNR 2000). Site-specific information is presented below.

A search of the archaeological and historic site records at the Washington State Office of Archaeology and Historic Preservation (OAHP) indicated that no properties listed in the National Register of Historic Places (NRHP) or the Washington State historic site register are recorded within the project area. Although no cultural resources have been previously recorded within the project area, the project's location at the confluence of two salmon streams represents an area likely to contain evidence of prehistoric activity and a comprehensive archaeological investigation is being conducted.

3.11 Native American Concerns

The cultural and historic resources of the Green/Duwamish River basin are described in detail in Section 3.16 of the FPEIS (USACE and King County DNR 2000). Site-specific information is presented below.

The Soos Creek System is within the usual and accustomed fishing area of the Muckleshoot Indian Tribe. The Muckleshoot tribe considers the fisheries resources of the Soos Creek/Green River system to be an invaluable resource, and a primary goal of the tribe is to protect and restore each run of fish in its usual and accustomed fishing area. A traditional fishing area lies at the lower end of Soos Creek and downstream of Soos Creek in the Green River (Muckleshoot Indian Tribe Fisheries Department Comment Letter of Jan 8, 1990 in King County, 1990).

3.12 Land Use

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.11 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Description of Watershed Area,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the section titled “Land Use.” A discussion of land use relevant to the proposed restoration project site follows.

The Soos Creek subbasin is undergoing rapid urbanization, particularly in the north and west portions of the basin, west of Big Soos Creek (Kerwin and Nelson, 2000; King County, 1990). This area contains a high density of urban subdivisions, commercial retail centers, and scattered single-family residences. The project area encompasses three undeveloped parcels, but is bounded on the north by 256th St. SE and a residential subdivision, and single-family residential developments on the west and southwest. Undeveloped land abuts the project area to the south, and Big Soos Creek and the associated Gary Grant Soos Creek Park lie to the east and southeast.

Historic aerial photos show that these parcels, or at least some portion of these parcels, were farmed. No farming activities occur at this time. Construction of a lift station for the SCWS district is scheduled to begin in 2004. The lift station is located at the top of the slope, south of the proposed creek alignment, on the westernmost parcel.

3.13 Recreation

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.12 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Gary Grant Soos Creek Park runs north to south along Big Soos Creek on the eastern edge of the project area. The 507 acre park begins approximately 4 miles upstream of the project site, and continues downstream for approximately 1 mile to the 16 acre Lake Meridian Park. The Soos Creek Trail crisscrosses the stream for the length of the park. The trail supports day-use recreation such as jogging, biking, and bird watching by local residents.

3.14 Air Quality and Noise

Information characterizing the air quality and noise levels within the Green/Duwamish River basin is described in detail in Sections 3.8 and 3.9 of the FPEIS (USACE and King County DNR 2000). A discussion of current site-specific information relevant to the proposed restoration project site is presented below.

The Puget Sound region has been an attainment area for carbon monoxide since October 11, 1996; the Seattle-Tacoma area has been an attainment area for ozone since November 25, 1996. As of May 14, 2001, the Seattle, Tacoma, Kent areas were classified as attainment areas for particulate matter (PM10) pollution (J. Anderson, Puget Sound Clean Air Agency, pers. comm. with Torrey Luiting, Corps Biologist on October 22, 2003 via email). Thus, the project area is within attainment areas for all criteria pollutants. The reductions in PM10 pollution that led to

attainment status are a result largely of changes enacted by the legislature in the 1991 Clean Air Washington Act (Puget Sound Clean Air Agency website: http://www.pscleanair.org/news/2001/05_14_epa.shtml). Those changes tightened up emission standards for wood stoves and fireplaces, prohibited outdoor burning in urban areas, and authorized an inspection program for diesel trucks and buses, which was implemented by the Department of Ecology. In addition, a partnership between the Clean Air Agency and the Northwest Hearth Products Association encouraged people to trade out their old wood stoves and fireplaces for cleaner natural gas, propane, pellet or EPA-certified models.

3.15 Transportation

Information characterizing traffic and transportation within the Green/Duwamish River basin is described in detail in Section 3.10 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the project site is presented below.

Traffic within the vicinity of the proposed project site occurs primarily along 256th St. SE that bounds the project site to the north. No traffic studies are available at this time, but it is likely that traffic volumes are highest during peak commuting hours. 256th St. SE serves as the main access road to numerous subdivisions and single-family residences that are located on the north side of Lake Meridian and south of the Meridian Valley Golf and Country Club.

3.16 Aesthetics

Information characterizing visual quality and aesthetic resources within the Green/Duwamish River basin is described in detail in Section 3.13 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the project site is presented below.

The containment of Meridian Valley Creek within the existing concrete flume greatly reduces the visual and aesthetic appeal of the creek. Only ten feet separate the flume from 256th St. SE. This area is mowed periodically, preventing the establishment of any vegetation other than weedy, fast growing species. On the south side of the flume, there are a number of large black cottonwood trees that line the south edge of the flume. Himalayan blackberry and Scot's broom grow in between the trees.

South of the line of cottonwood trees, the property is more aesthetically pleasing. Its undeveloped character and the presence of the emergent marsh and scrub-shrub wetland promote use of the property by wildlife, and provide a pleasant contrast to the adjacent developments. Invasive species like Himalayan blackberry and Scot's Broom are present, but do not dominate the landscape.

4 ENVIRONMENTAL EFFECTS

The effects of the proposed stream relocation project are compared against the baseline conditions associated with the no-action alternative.

4.1 Physical Characteristics

4.1.1. No Action

The current configuration of the channel will remain in place.

4.1.2 Preferred Alternative

Information describing the environmental effects on the physical characteristics of the Green/Duwamish River basin is presented in Section 4.4 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Meridian Valley Creek into a more natural streambed will result in improved habitat over that in the existing concrete flume. The meandering stream channel will mimic natural streams. A minimum of one foot of streambed gravel will line the channel, and numerous pieces of large woody debris (LWD), including root wads and debris piles, are incorporated into the design. Native trees and shrubs planted along the banks of the stream channel will provide a source of shade and organic material to the stream. The presence of the LWD will provide refuge for juvenile fish, and both the LWD and native trees and shrubs will enhance detrital production for juvenile fish prey. In addition, the relocated stream channel will be farther away from the road in all reaches, with an extensive undeveloped buffer in the lower 700 feet. This buffer will reduce the exposure of the stream to potential pollutants from roadside runoff into the stream. Although the preferred alternative will result in the loss of 0.3 acres of the existing emergent and scrub/shrub wetland, the new streambed will increase habitat complexity and diversity, ultimately increasing the aquatic functions and values of the site.

4.2 Topography, Geology, and Soils

4.2.1 No Action

As described above in section 4.1.1, there will be no alternative of the topography of the area or ground disturbances related to this project. The creek will remain in its current configuration until the road is eventually widened.

4.2.2 Preferred Alternative

Information describing the environmental effects on the topography, geology, and soils of the Green/Duwamish River basin is presented in Section 4.4.1 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

The construction of the western most 200 feet of the proposed stream channel will require excavation into the steep slope in the western portion of the project area. Construction of a rock wall will minimize the extent of the excavation and stabilize the slope. The height of the rock wall will vary, reflecting the topography of the hillside. The maximum height of the wall will be approximately 6.5 feet above the stream channel and the minimum height approximately 2 feet. In the lower 900 feet of the channel, the change in topography will be slight. In this portion of the project area, the average channel depth will start at three feet and will reduce to one and one half feet as the channel becomes wider and shallower in the lower portion of the channel. Side slopes in this area will be 2:1.

Disturbance from construction will be short-term and temporary. The proposed project will change the topography in the vicinity because of the cut into the hillside and associated rock wall construction, and the creation of the stream channel in the marsh. However, impacts to the site topography, geology, and soils will be minor. No substantial long-term increase in erosion or soil instability will occur. There will be a pulse of sedimentation following diversion of the stream into the restored streambed, resulting in short term turbidity increases as the streambed adjusts to the new flow, and localized shifting of sediments will continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction will continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity over that normally seen during high flow events. However, the proposed project will not significantly affect the topography, soils, or geology of the proposed streambed location. Potential short-term disturbance of surface sediments will be mitigated to a level of insignificance by control measures such as mechanical retardation, runoff control, sediment basins, and re-vegetation.

4.3 Hazardous and Toxic Materials

4.3.1. No Action

Petroleum products and possibly other hazardous materials will continue to be released into the creek due to it being contiguous to 256th St. SE.

4.3.2. Preferred Alternative

Information describing the environmental effects on hazardous and toxic materials of the Green/Duwamish River basin is presented in Section 4.4.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

During construction and installation activities, fuels, oils, lubricants, and other hazardous materials will be used. An accidental release or spill of any of these substances could occur. A spill could result in potentially adverse impacts to on-site soils. However, the amounts of fuel and other lubricants and oils would be limited, and the equipment needed to quickly limit any contamination will be located on site.

To minimize the likelihood of potential spills and leaks of petroleum and hydraulic fluids during project construction, construction equipment will be inspected daily for leaks and petroleum contamination. Additionally, a spill prevention control and containment plan designed to reduce impacts from spills (fuel, hydraulic fluid, etc.) will be in place prior to the start of construction. Finally, the project will not introduce any hazardous materials to the project areas.

4.4 Hydrologic Regime

4.4.1 No Action

Changes might occur to the hydrologic regime due to buildout in the basin causing increased peak flows. However, possible changes would be ameliorated by new developments conforming to current stormwater control standards.

4.4.2 Preferred Alternative

Information describing the environmental effects on the water resources of the Green/Duwamish River basin is presented in Section 4.5 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

A hydrogeologic characterization report by Northwest Land & Water, Inc (Oct., 2003) indicates that flow losses between 0.3 cfs and 2.5 cfs during the summer months may occur in the upper reach of the engineered stream channel. These losses are of a large enough magnitude that it will require substantial upstream surface water inflow to maintain continuous creek flow through this reach. Constructing an engineered, low permeable creek bed will prevent the major water loss through this reach. In the lower reaches of the channel, it appears that the creek will gain water from the wetland through both overland flows and groundwater discharge.

Construction of the channel may dewater the small wetland in the upper reach of the stream, but is unlikely to alter the hydrology of the large wetland. Aerial photos indicated that Meridian Valley Creek originally flowed through this wetland to its confluence with Big Soos Creek.

4.5 Water Quality

4.5.1 No Action

Water Quality will continue to be degraded in the creek due to the proximity to 256th St. SE.

4.5.2 Preferred Alternative

Information describing the environmental effects on the water quality of the Green/Duwamish River basin is presented in Section 4.6 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

There will be small-scale, temporary increases in turbidity within the wetland and Big Soos Creek as a result of construction activities, particularly those in the lower reach of the channel alignment through the wettest portion of the wetland. The largest impact will occur during the connection of the relocated channel and Big Soos Creek. In addition, there will be a pulse of sedimentation following diversion of the stream into the restored streambed, resulting in short term turbidity increases as the streambed adjusts to the new flow. Localized shifting of sediments will continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction will continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity over that normally seen during high flow events.

In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids in Big Soos Creek, all 'in-water' construction work will take place during the appropriate fish window (August 1 to August 31, or as otherwise determined by WDFW) and during the driest time of the year. Construction techniques, sequencing, and timing will minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channel to the Big Soos Creek. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans will incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity. Turbidity monitoring during construction will ensure that these temporary increases are in compliance with State Water Quality Conditions.

Overall, water quality in Meridian Valley Creek should slightly improve as a result of the project. Stormwater from 256th St. SE will no longer run off directly into the creek, and the buffering wetland will act to filter pollutants from the runoff before it enters the creek. In addition, as the native trees and shrubs along the streambank mature, they will shade the stream channel, preventing further increases in water temperature. Finally, LWD in the stream channel will also provide localized areas of temperature refuge for foraging salmonids utilizing the restoration site.

4.6 Vegetation

Information describing the environmental effects on vegetation in the Green/Duwamish River basin is presented in Section 4.8 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

4.6.1 Upland Areas

4.6.1.1 No Action. Under the no action alternative no vegetation will be disrupted in the project area until 256th St. SE is widened.

4.6.1.2 Preferred Alternative. In the upper portion of the proposed stream channel, several big-leaf maple, black cottonwood trees, and red alders, as well as numerous understory plants will be removed to accommodate the new channel alignment. Most of these trees are less than 18 inches diameter at breast height (DBH). The largest tree that may be removed is a double trunk big-leaf maple that is approximately 60 inches DBH. In addition, sapling alders, Himalayan and evergreen blackberry, various herbaceous species will be removed. Upon completion of the constructed channel, the channel banks and any other disturbed areas will be re-vegetated with native trees and shrubs. In addition, all large trees removed for the project construction will be retained and used on-site as habitat features.

4.6.2 Wetland Areas

4.6.2.1 No Action. Under the no action alternative no wetlands will be disrupted in the project area until 256th St. SE is widened.

4.6.2.2 Preferred Alternative. The majority of the trees to be removed in the upper portion of the proposed stream channel are in the small wetland. Most of these are small black cottonwood or red alder trees that are less than 18 inches diameter at breast height, but there are a few large trees (greater than 24 inch DBH). In the large wetland, removal of some willows will occur. However, the channel design avoids the majority of the willow clumps. Near the proposed confluence with Big Soos Creek, the willows are more closely spaced and are larger, making it impossible to avoid them all.

The stream channel banks and all other disturbed areas will be restored with native emergent plants, shrubs, and trees. Replanting of some of the disturbed areas may occur with native material salvaged from the stream channel construction (e.g. willow whips from downed trees, small-fruited bulrush); otherwise, suitable materials will be obtained from local nurseries that specialize in native plants.

The proposed action is consistent with the requirements of Nationwide Permit (NWP) 27 for stream and wetland restoration activities. Under this permit, compensatory mitigation is not required if the authorized work results in a net increase in aquatic resource functions and values in the project area. While the project will result in the loss of the 0.3 acres of the existing emergent and scrub-shrub wetland, the newly constructed streambed will provide enhanced functional value of the area for fish, and similar function and value for mammals, amphibians, aquatic insects, other invertebrates, and birds. Planting native trees and shrubs along the streambank will increase the extent and species diversity of wetland, riparian, and upland vegetation on the restoration site. In addition, these plants will increase the habitat value of the site by creating additional opportunities for foraging, nesting, cover, and refuge for a wide variety of species.

4.7 Fish

4.7.1 No Action

The upper portion of the flume will continue to be a barrier to fish passage during low flow periods, and during high-flow periods, fish will continue to be flushed into Big Soos Creek because of the relatively high gradient of the upper flume and the lack of off-channel refuge habitat in the flume. These habitat problems will continue to contribute to the decline of the fisheries in the Soos Creek Subbasin, and ultimately, to the Green/Duwamish Ecosystem and would be counter to the goals identified in the EIS.

4.7.2 Preferred Alternative

Information describing the environmental effects on the fisheries resources of the Green/Duwamish River basin is presented in Section 4.7 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Meridian Valley Creek into a more natural streambed will result in improved habitat over that in the existing concrete flume. The meandering stream channel will mimic natural streams and will contain numerous off-channel habitat areas that will provide foraging

and refuge opportunities. Streambed gravel will line the channel, providing spawning habitat and better substrate for the production of aquatic insects and other benthic and epibenthic organisms upon which juvenile salmonids may prey. Native trees and shrubs planted along the banks of the stream channel will provide shade, prey items (e.g. falling insects), and other organic material. LWD in the stream will provide refuge for juvenile fish, and both the LWD and native trees and shrubs will enhance detrital production for juvenile fish prey. Finally, the relocated stream channel will be farther away from the road in all reaches, with an extensive undeveloped buffer along the lower 700 feet. This buffer will reduce the exposure of fish in the stream to potential pollutants from roadside runoff. Although the preferred alternative will result in the loss of the 0.3 acres of the existing emergent and scrub/shrub wetland, the new streambed will result in increased habitat complexity and diversity that ultimately increases the aquatic functions and values of the site.

Water quality impacts such as increased turbidity and decreased dissolved oxygen during the periods of 'in-water' work could reduce the suitability of a localized area of Big Soos Creek and of the on-site wetland for fish during construction, but this effect will be temporary and localized. All 'in-water' work will be conducted within the fish window of August 1 to August 31. Avoiding 'in-water' work during peak salmonid out migration periods (generally between February 15 and July 15) will minimize the short-term effects of the project construction on juvenile salmonids.

Diversion of the stream from the existing flume into the newly constructed stream channel may strand fish in the flume. During the dewatering process, a biologist will be on-site to rescue any stranded fish and transport them via buckets or other containers to Big Soos Creek for release. Additional recommendations for procedures to implement during the dewatering phase may arise from consultation with WDFW. No significant or long-term negative impacts on fish populations in either Big Soos Creek or Meridian Valley Creek are expected because of the construction activities.

4.8 Wildlife

4.8.1 No Action

No changes to wildlife use would occur in the area.

4.8.2 Preferred Alternative

Information describing the environmental effects on wildlife of the Green/Duwamish River basin is presented in Section 4.9 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Wildlife that is foraging or resting in the vicinity of the project at the time of construction may be temporarily displaced due to the noise and movement of the machinery. However, these effects will be temporary and displaced animals will likely return to the area after construction is completed. As urban-adapted predators, bald eagles and other raptors that may be foraging over

the area are unlikely to be affected by the construction activities as they forage for fish and birds over Big Soos Creek. No breeding or nesting areas will be directly impacted, as the construction will take place in mid to late summer. Construction of the restoration site is not expected to result in a long-term reduction in the abundance or distribution of any prey items that local wildlife may be seeking. Planting native trees and shrubs along the streambank will increase the extent and species diversity of wetland, riparian, and upland vegetation on the restoration site. These plants will increase the habitat value of the site by creating additional opportunities for foraging, nesting, cover, and refuge for a wide variety of species.

4.9 Threatened and Endangered Species

4.9.1 No Action

The continued degraded condition of the creek would influence prey base for Chinook salmon as well as reducing rearing habitat in the Soos Creek subbasin. Prey base for bald eagle would also remain at a reduced level. No other effects on other listed species is anticipated.

4.9.2 Preferred Alternative

Information describing the environmental effects on threatened and endangered fish species of the Green/Duwamish River basin is presented in Section 4.7.4 of the FPEIS (USACE and King County DNR 2000); the effects on threatened and endangered plant species is presented in Section 4.8.3 of the FPEIS and effects on threatened and endangered wildlife species is presented in Section 4.9.2 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Meridian Valley Creek into a more natural streambed will result in improved habitat over that in the existing concrete flume. The meandering stream channel will mimic natural streams and will contain numerous off-channel habitat areas that will provide foraging and refuge opportunities. Streambed gravel will line the channel, providing spawning habitat and better substrate for the production of aquatic insects and other benthic and epibenthic organisms upon which juvenile salmonids may prey. Native trees and shrubs planted along the banks of the stream channel will provide shade, prey items (e.g. falling insects), and other organic material. LWD in the stream will provide refuge for juvenile fish, and both the LWD and native trees and shrubs will enhance detrital production for juvenile fish prey. Finally, the relocated stream channel will be farther away from the road in all reaches, with an extensive undeveloped buffer along the lower 700 feet. This buffer will reduce the exposure of fish in the stream to potential pollutants from roadside runoff. Although the preferred alternative will result in the loss of the 0.3 acres of the existing emergent and scrub/shrub wetland, the new streambed will result in increased habitat complexity and diversity that ultimately increases the aquatic functions and values of the site.

These habitat improvements will directly increase foraging habitat for Puget Sound Chinook salmon, Coastal/Puget Sound bull trout, and bald eagles by increasing habitat for the fish and invertebrates that they feed on. The installation of large woody debris and the undulating edges

of the project design will also enhance refuge and foraging opportunities for Puget Sound Chinook salmon and Coastal/Puget Sound bull trout.

The in-water construction of this project will occur when juvenile and adult Puget Sound chinook salmon and bull trout are least likely to be present in Big Soos Creek, and during the portion of the year when bald eagles are not nesting and are most tolerant of disturbance. Therefore, while the proposed construction may affect these species, it is not likely to adversely affect them.

The effect determinations made in the Programmatic Biological Assessments for this project are listed in Table 2. The USFWS concurred with the determination of “may affect, but not likely to adversely affect” for the bald eagle, marbled murrelet, northern spotted owl, gray wolf, Canada lynx, and bull trout in relation to the Meridian Valley Creek restoration project via a concurrence letter dated March 27, 2001 (Appendix D). Similarly, NOAA Fisheries concurred with the determination of “may affect, but not likely to adversely affect” for Puget Sound chinook salmon in relation to the Meridian Valley Creek restoration project via a concurrence letter dated April 10, 2001 (Appendix D).

Table 2. Threatened and Endangered Species Effect Determination Summary

Species	Listing Status	Critical Habitat	Effects Determination	Services Concurrence for Meridian Valley Creek Restoration?
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—	Not likely to adversely affect	Yes
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Gray Wolf <i>Canis lupus</i>	Threatened		Not likely to adversely affect	Yes
Canada Lynx <i>Lynx canadensis</i>	Threatened	—	Not likely to adversely affect	Yes
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	—	Not likely to adversely affect	Yes
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes

4.10 Cultural Resources

4.10.1 No Action

No disturbance to any possible cultural and historic resources would occur until the proposed widening of 256th St. SE.

4.10.2 Preferred Alternative

Information describing the effects on cultural and historic resources of the Green/Duwamish River basin is presented in Section 4.18 of the FPEIS (USACE and King County DNR 2000).

Professional cultural resources studies are being conducted for the proposed project. These studies have defined the Area of Potential Effect (APE) as the immediate project area where ground disturbing activities will occur. If historic properties eligible for the National Register of Historic Places are found to be present in the project area, a programmatic agreement for data recovery (if necessary) will be developed in consultation with the Muckleshoot Tribe and the OAHF that describes specific measures that will be taken to mitigate adverse effects resulting from the project. These contingencies have been factored into the overall cost of the project.

4.11 Native American Concerns

4.11.1 No Action

There would be no change in Native American concerns for the site.

4.11.2 Preferred Alternative

Information describing the effects on cultural and historic resources of the Green/Duwamish River basin is presented in Section 4.18 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

The project will improve habitat available to salmon in Meridian Valley Creek by improving the quality of rearing and foraging habitat available to this important resource for Native American Tribes in the area. Coordination with the Muckleshoot Indian Tribe is ongoing to ensure tribal concerns are incorporated into the site design. Construction timing of the project should avoid impacts to both out-migrating juvenile salmonids and adults moving upstream to spawn. Thus, construction would also avoid impacts to fishing rights of the Muckleshoot Indian Tribe.

4.12 Land Use

4.12.1 No Action

There would be no change in land use at the site until the proposed widening of 256th St. SE takes place.

4.12.2 Preferred Alternative

Information describing the environmental effects on land and shoreline use in the Green/Duwamish River basin is presented in Section 4.13 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Land use in the project vicinity will not change because of the creek relocation. The proposed project will not affect land use in areas adjacent to the project area, including nearby residential properties. However, construction vehicles may disrupt traffic for local residents. These impacts will be temporary and highly localized, and are therefore not expected to be significant.

4.13 Recreation

4.13.1 No Action

No changes in recreation would occur on the site.

4.13.2 Preferred Alternative

Information describing the environmental effects on recreation in the Green/Duwamish River basin is presented in Section 4.14 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

The installation of the interpretive trail and its associated viewing platform may result in increased passive recreational use of the project area. Local residents and users of the Gary Grant Soos Creek park/trail may visit the site. However, the necessity of traversing the shoulder of 256th St. SE from the Gary Grant Soos Creek Park crossing at 148th Ave. SE, is likely to limit the number of visitors to the park that utilize this trail and viewing platform.

Noise associated with the usage of heavy machinery may disturb recreational users of the Gary Grant Soos Creek Park. However, these impacts will be temporary and highly localized, so no significant impacts on recreation are anticipated following construction.

4.14 Air Quality and Noise

4.14.1 No Action

No changes in air quality or noise would occur on site.

4.14.2 Preferred Alternative

Information describing the environmental effects on air quality and noise in the Green/Duwamish River basin is presented in Sections 4.10 and 4.11, respectively, of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Construction vehicles may temporarily increase air emissions and noise in the immediate project vicinity. Noise associated with the use of heavy machinery may disturb recreational users of the Gary Grant Soos Creek Park along Big Soos Creek and local homeowners. However, these impacts will be temporary and highly localized, and will not result in significant impacts. These emissions will not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan.

4.15 Transportation

4.15.1 No Action

No changes to transportation patterns will occur until the widening of 256th St. occurs.

4.15.2 Preferred Alternative

Information describing the environmental effects on traffic and transportation in the Green/Duwamish River basin is presented in Section 4.12 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Construction vehicles may temporarily increase the volume of traffic in the immediate project vicinity during excavation of the site. They may also disrupt traffic along 256th St. SE as vehicles access and depart the construction site. This may cause a slight increase in congestion during peak commuting hours. However, these impacts will be temporary and highly localized, and are not expected to be significant. To minimize traffic impacts, a traffic control plan will be developed and implemented.

4.16 Aesthetics

4.16.1 No Action

No changes to aesthetics are anticipated to occur.

4.16.2 Preferred Alternative

Information describing the environmental effects on visual quality and aesthetic resources of the Green/Duwamish River basin is presented in Section 4.15 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Removing Meridian Valley Creek from the existing concrete flume and relocating it into a more natural stream channel will greatly improve the visual and aesthetic appeal of the creek. An excellent buffer of emergent and scrub-shrub vegetation will shield the creek from 256th St. SE for the majority of the reach, increasing the attractiveness of the creek to wildlife. The planned

interpretive trail will enable recreational users to view the restored creek and the wetland through which it will meander.

During excavation and construction of the site, the aesthetic quality of the general area could be reduced due to the noise and air emissions generated by the construction equipment, which may disturb recreational users of the Gary Grant Soos Creek Park, or local homeowners. However, these impacts will be temporary and highly localized, and are not expected to result in significant impacts.

5 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects of the proposed project include:

(1) noise disturbance to wildlife, homeowners, and recreational users in the vicinity of operating heavy machinery during excavation and construction of the restoration site; Most wildlife are anticipated to avoid the area while work is in progress. To reduce impacts work will be conducted only during daylight hours in accordance to local noise ordinances.

(2) disruption of local traffic in the project vicinity during construction; Proper signage and flagmen will be utilized to address safety concerns and move traffic through the area as quickly as possible.

(3) mortality of emergent and scrub-shrub wetland vegetation within the project site; Planned plantings onsite will compensate for this impact.

(4) excavation of approximately 0.3 acres of existing emergent and scrub-shrub wetland; The enhancement of the remaining wetlands by routing a creek channel through the area will compensate for loss by increasing the functions of the wetlands.

Given the temporary, localized, and minor nature of these effects, the Corps has determined that the proposed restoration project will not result in significant adverse environmental impacts.

6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed restoration project would not entail any significant irretrievable or irreversible commitments of resources. The construction work would require use of existing machinery and export of the fill material to an existing, licensed landfill for disposal. Installation of the constructed stream channel will require the importation of stream gravel, LWD, and large rock for the rock wall. Replanting the newly established streambank and disturbed wetland areas will require contracting with local existing nurseries for native plant materials and hiring existing contractors to plant the site.

7 CUMULATIVE IMPACTS

Cumulative impacts result from the “individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). As such they include the impacts of this restoration project considered in conjunction with current and future restoration projects constructed or planned within the lower Green/Duwamish River watershed.

Multiple restoration projects are ongoing in the Soos Creek sub-basin, and numerous projects are taking place in the Meridian Valley Creek watershed. Specifically, the City of Kent is planning to replace three culverts on Upper Meridian Valley Creek later this year (2004) with larger fish passable culverts. The City also plans to daylight a portion of the Clark Lake Outlet that currently passes through a 24-inch pipe for 310 feet into a constructed stream channel enhanced with fish habitat structures and native riparian plantings. Additional projects planned or on-going in the Meridian Valley Creek watershed include additional channel improvements, culvert replacements and the removal of other fish passage barriers, invasive plant removal, re-vegetation with native plants, limiting livestock access to creeks, and public outreach efforts to educate the public about land use impacts. All of these efforts will result in long-term, cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition, and will ultimately increase the ability of the watershed to support critical life history stages of native fish and wildlife population.

Negative effects of the Meridian Valley Creek Restoration project add to the cumulative negative effects generated through adverse land use practices in the watershed. However, these negative effects are temporary and are associated only with the actual construction of the project, concentrated mainly in the channel construction in the large wetland and as the new stream channel is hydraulically joined to Big Soos Creek. The combination of mitigation measures and BMPs reduce the cumulative, short-term (i.e. construction related) impacts of these projects to an insignificant level. More significantly, the beneficial effects generated by the project compensate for these short-term negative effects. Thus, the proposed restoration project will have beneficial cumulative effects within the watershed and will incrementally offset adverse impacts on habitats from past, present, and future redevelopment projects along Big Soos Creek.

8 ENVIRONMENTAL COMPLIANCE AND COORDINATION

LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES	ISSUES ADDRESSED	CONSISTENCY OF PREFERRED ALTERNATIVE
National Environmental Policy Act (NEPA) 42 U.S.C. 4321 et seq.	Requires all federal agencies to consider the environmental effects of their actions and to seek to minimize negative impacts.	Consistent per FONSI and EA document.
State Environmental Policy Act (SEPA) RCW 43.21	Requires state agencies to consider the environmental effects of their actions and actions of permit applicants.	Consistent
Clean Water Act (CWA) 33 U.S.C. 1251 et seq.; Section 404	Requires federal agencies to protect waters of the United States. Disallows the placement of dredged or fill material into waters (and excavation) unless it can be demonstrated there are no reasonable alternatives. This restoration activity is proposed under the authority of a Nationwide 27 permit.	Consistent per 404(b)(1) Evaluation.
Clean Water Act Section 401	Requires federal agencies to comply with state water quality standards.	Consistent per conditions as outlined in the NW 27 permit.
Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.	Requires federal agencies to consult with the US Fish & Wildlife Service on any activity that could affect fish or wildlife.	Consistent based on acceptance of Final FWCA Report prepared for the

		FEIS.
Endangered Species Act 16 U.S.C. 1531 et seq.;	Requires federal agencies to protect listed species and consult with US Fish & Wildlife or NMFS regarding the proposed action.	Consistent based on the Biological Assessment prepared for the FEIS.
National Historic Preservation Act 16 U.S.C. 461;	Requires federal agencies to identify and protect cultural and historic resources.	Consistent upon review of determination of affect by SHPO.
Shoreline Management Act (SMA) and Shoreline Management Program (SMP) RCW 90.58, WAC 173-14	State law implementing the Coastal Zone Mgmt Act requiring local jurisdictions to plan and protect shorelines.	Neither Big Soos Creek in this reach nor Meridian Valley Creek are shorelines of the state.
Coastal Zone Management Act (CZMA) 16 U.S.C. 1451 et seq.; 15 CFR 923	Requires federal agencies to comply with state and local plans to protect and enhance coastal zone and shorelines.	Consistent to the maximum extent practicable.
Washington Hydraulic Code	Requires proponents of developments, etc to protect state waters, wetlands and fish life.	Will be consistent with HPA conditions issued by WDFW.
Executive Order 11988, Floodplain Management Guidelines	Requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely effect natural floodplain values.	Consistent; project will not induce growth in floodplain and will restore natural floodplain values.
Executive Order 11990: Protection of Wetlands	Encourages federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs.	Consistent per 404(b)(1) Evaluation, net increase in aquatic functions and values because of restoration project.
Executive Order 12898: Environmental Justice	Requires federal agencies to consider and address environmental justice by identifying and assessing whether agency actions may have disproportionately high and adverse human health or environmental effects on minority or low-income populations.	Consistent due to lack of adverse human health or environmental effects on minority or low-income populations in local area.

Copies of the Draft Environmental Assessment and FONSI were provided to the following organizations for Review and comment:

Muckleshoot Indian Tribe
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Environmental Protection Agency
Washington State Department of Ecology
Washington State Department of Fish and Wildlife
Washington State Historic Preservation Office
City of Kent

In addition a Notice of Availability was sent out to adjacent property owners as well as selected interested parties identified by the Washington State Department of Ecology, City of Kent, and the Seattle District Regulatory Branch. The draft documents were also posted on the Seattle District website. Site visits were conducted on December 22, 2003 with Department of Ecology, and April 4, 2004 with Department of Fish and Wildlife. In addition, Seattle District

representatives met with staff members for the Muckleshoot Indian Tribe on December 3, 2003 and discussed project details with them. The Green Duwamish ERP Technical Committee that includes representatives from all the agencies listed above except the Washington State Historic Preservation Office also reviewed project details.

The Draft Environmental Assessment and FONSI were circulated for 30 days and no written comments were received. Washington State Department of Ecology and Department of Fish and Wildlife did provide verbal comments on protection of wetlands, the proposed Stormwater Pollution Protection Plan, gravel size in the lower channel, and the extension of the culvert under S.E. 256th Street. These comments are being addressed in the final design drawings.

9 CONCLUSION

Based on this Environmental Assessment and on coordination with Federal agencies, Native American Tribes, and State agencies, the Meridian Valley Creek Restoration project is not expected to result in significant adverse environmental impacts. The Meridian Valley Creek Restoration project is not considered a major Federal action having a significant impact on the human environment. Therefore, the preparation of an environmental impact statement supplement is not required.

10 REFERENCES

- Associated Earth Sciences, May 2002. Wetland Identification and Stream Identification Report: Lift Station 10B, Kent, WA. Prepared for Soos Creek Water and Sewer District. Project number KB02226A.
- Aqua Terra Consultants, 1999. Meridian Annexation Area Hydrological Analysis, City of Kent.
- City of Kent Municipal Code, Wetlands Management (Title 11.05).
- Fore, L.S., J.R. Karr, and R.W. Wisseman. 1997. A benthic index of biotic integrity for streams in the Pacific Northwest. *Journal of the North American Benthological Society*.
- Grette, G.B. and E.O. Salo. 1986. The Status of Anadromous fishes in the Green/Duwamish River System. Final report submitted to Seattle District, U.S. Army Corps of Engineers, Seattle, WA.
- HARZA, 1999. 1998 Fish Habitat and Fish Population Survey. Conducted for and submitted to the City of Kent, WA.
- Kerwin, J. and T. S. Nelson, (Eds.). December 2000. "Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island)." Washington Conservation Commission and the King County Department of Natural Resources.
- King County Surface Water Management Division (King County), 1990. Soos Creek Basin Plan and Final Environmental Impact Statement.

- MGS Engineering Consultants, Inc., 2003. Meridian Valley SE 256th St. Flume Removal Project, Hydrologic Analysis Using HSPF. Prepared in Cooperation with Montgomery Water Group.
- Northwest Land & Water, Inc. 2003. Hydrogeologic Characterization Report for SE 256th Street Flume Removal, Meridian Valley Creek Restoration Project, Kent, WA. Prepared for Montgomery Water Group In October 2003.
- SalmonWeb, 2000. Volunteer Report – 1999 Biological Monitoring Data. SalmonWeb, Seattle, WA.
- Shannon and Wilson, Inc., 2003. Wetland Delineation for the Proposed Meridian Valley Creek Relocation Project, Kent, WA. Prepared for the City of Kent in May 2003. Project Number 21-1-12107-001.
- Snyder, D. E., P. S. Gale, and R. F. Pringle. 1973. Soil Survey of King County Area, Washington. United States Department of Agriculture, Soil Conservation Service. 100 pages, plus maps.
- Taylor Associates. 2000. City of Kent Surface Water Quality Program, 1999 – 2000 Monitoring. Prepared for City of Kent, Public Works Engineering Department.
- U.S. Army Corps of Engineers (USACE), 2004. Property Inspection Check List for Preliminary Assessment Screening at Meridian Valley Creek.
- U.S. Army Corps of Engineers (USACE) and King County Department of Natural Resources (DNR). 2000. Programmatic NEPA/SEPA Environmental Impact Statement and Green/Duwamish River Restoration Plan. Seattle, WA.
- U.S. Army Corps of Engineers (USACE), 1997. Green/Duwamish River Basin General Investigation Ecosystem Restoration Study Reconnaissance Phase. January. Seattle District. Seattle, WA.
- Washington State Department of Ecology (WA DOE), 1997. Washington State Wetlands Identification and Delineation Manual: Publication #96-94. Washington Department of Ecology, Olympia, Washington.
- Washington State Department of Fish and Wildlife (WDFW), 2003. Priority species and habitat maps.